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ABSTRACT

This newsletter, published by the Task Group on Education in Astronomy, focuses on astronomy education both for the public and for schools. Topics in this issue include new publications related to astronomy education; a roster of consultants on astronomy education; a collection of course syllabuses (college level); teaching astronomy in schools, colleges, and planetaria; the introduction of astronomy in high schools; astronomy in the National Parks; and travelling astronomy exhibits. (MH)

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Astronomy Education

December 1974

THIRD NEWSLETTER OF THE

TGEA = Task Group on Education in Astronomy of the
AAS = American Astronomical Society, assembled by
Donat G. Wentzel, University of Maryland.

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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CONTENTS

page

- 1 TGEA members, tasks and addresses
- New publications related to astronomy education
 - 2 a) Laboratory manuals for non-science majors
 - 2 b) Journal articles related to laboratory instruction (by H. Kruglak)
 - 2 c) Journals and publications devoted to astronomy
 - 3 d) Some recent films
- Report on TGEA activities
 - 4 a) Roster of consultants on astronomy education
 - 4 b) A collection of course syllabuses
 - 4 c) Education sessions at the Rochester AAS meeting
 - 4 "Teaching of Astronomy in Schools, Colleges and Planetaria"
(by L. Shapiro)
 - 6 d) How do we best introduce modern astronomy in the high-schools?
 - 7 e) Astronomy in the National Parks
 - 7 f) Traveling astronomy exhibit for schools and planetariums
- 7 Financial support - including summer jobs for teacher-astronomers
- 8 An "Editorial" - What should be the role of the TGEA? (by D. Wentzel)
- 8 Call for information on laboratory teaching (by H. Kruglak)

This newsletter is available (free) from D. Wentzel (address below) for anyone not yet on the TGEA mailing list. It is funded in part by the AAS, in part by the 30% of the 550 recipients of the previous newsletter (laboratory exercises, July 1973) who sent in contributions. Thank you for that gratifying response.

Printed at the Department of Physics and Astronomy, University of Maryland.

TGEA MEMBERS, TASKS AND ADDRESSES

The TGEA is a committee of the AAS that has never formally met. Each member has accepted one specific task. If you are interested in participating, write to the appropriate person.

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| <p>D. Wentzel; chairman newsletter.
Astronomy Program, University of Maryland,
College Park, Md. 20742</p> <p>C. Verschuur; chairman in 1973, co-ordination
of astronomy articles and announcements in
education journals, NASA brochures.
Fiske Planetarium, Boulder, Colo. 80302</p> <p>M. Gurin; AAS Executive Officer, education
consultants roster. 211 FitzRandolph,
Princeton, N.J. 08540</p> <p>H. Kruglak; laboratory exercises. Physics
Dept., Western Michigan University,
Kalamazoo, Mich. 49001</p> <p>P. Knappenberger; high-school astronomy.
Science Museum of Virginia, Richmond,
Va. 23219</p> <p>V. Chamberlain; astronomy in the parks.
Air and Space Museum, Washington, D.C.
20560</p> | <p>V. Jettner; co-ordination with planetariums,
traveling exhibit. Astronomy Dept., State
University of New York, Albany, N.Y. 12222</p> <p>J. Wertz; course syllabus collection. 4100
Crosswick Turn, Bowie, Md. 20715</p> <p>W. Straka; astronomy sessions for NSTA and
other organisations. Physics Dept.,
Jackson State College, Jackson, Miss. 39217</p> <p>A. Fraknoi; co-ordination with Astronomical
Society of the Pacific. 75 Southgate Ave.,
Daly City, Calif. 94015</p> <p>T. Swihart; co-ordination with Commission 46
(Teaching of Astronomy) of the International
Astronomical Union. Steward Observatory,
University of Arizona, Tucson, Ariz. 85721</p> <p>K. Franklin; AAS Public Information
Representative. Hayden Planetarium,
New York, N.Y. 10024</p> |
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NEW PUBLICATIONS RELATED TO ASTRONOMY EDUCATION

a) New laboratory manuals for the non-science major.

An Introduction to Experimental Astronomy, by R. B. Culver, with instructor's manual, W. H. Freeman, San Francisco, 1974, 195 pp. \$4.00.

Observational Activities and Experiments, by M. Gainer, Allyn and Bacon, Boston, 1974, 144 pp. \$5.95.

Both of the above emphasize use of astronomical photographs.

Astronomy through Practical Investigations, by G. Lomaga, W. Smiley, and R. Warasila, L.S.W. Associates, P.O. Box 82, Mattituck, New York 11952. 30 topics (exercises), each in a booklet at \$0.35; available in form of students' individualized packets for five or more topics.

b) Journal articles relevant to laboratory instruction.
(compiled by H. Kruglak)

Culver, R. B., "A Student Exercise in Determining the Velocity of Light," Am. J. Physics, 42, pp. 776-8, September 1974.

Downing, G. L., "Approximating Sidereal Time," School Science and Mathematics, 74, pp. 91-4, February 1974.

Erlichson, H., "The Horizontal Sundial," Am. J. Physics, 42, pp. 372-3, May 1974.

Green, R., "Laboratory Model Experiment of a Satellite Navigation System," Am. J. Physics, 41, pp. 710-2, May 1973.

Kruglak, H., "A Simplified Sunset Demonstration," The Physics Teacher, 11, p. 559, December 1973 (also in The Science Teacher, February 1974).

Laird, D. E., "Project Vesta: A Laboratory Exercise on the Measurement of Celestial Coordinates," The Physics Teacher, 12, pp. 338-42, September 1974.

Moché, D. L., "Audiovisual Aids for Astronomy and Space Physics at an Urban College," The Physics Teacher, 11, pp. 409-13, October 1973.

Sorenson, G. W., "Determining an East-West Line with the Shadow of the Sun," School Science and Mathematics, 72, pp. 593-9, October 1972.

Turtle, R., "Making a Protractor," The Physics Teacher, 12, pp. 351-5, September 1974.

c) Journals and publications devoted to astronomy.

Mercury, the popular journal of the Astronomical Society of the Pacific, will carry several new features: The Universe in the Classroom (new ideas, techniques, courses in the teaching of astronomy); Book Trek (annotated bibliographies on selected topics, organized by level of difficulty); Observing Astronomers (interviews of astronomers as real live people and scientists); Cosmic Perspective, a series of high-school supplements starting with the Sep./Oct. 1974 issue, relating astronomy to other areas such as chemistry, art, history (organized to be reprinted and distributed widely if funding can be found). (For Mercury and A.S.P. membership send \$6.50 to Astr. Soc. Pacific, 75 Southgate Avenue, Daly City, California 94015.)

Astronomy has been growing in popularity by leaps and bounds. Its level and color are aimed at a somewhat more popular audience than is Sky and Telescope. (\$12 per year; Astronomy Circulation Services, 1726 N. First St., Milwaukee, Wisc. 53212).

Griffith Observer now prints the winning articles of the Hughes Aircraft Essay Competition. (\$3 per year; P.O. Box 27787, Los Angeles, Calif. 90027).

Science News had special astronomy issues Aug 18&25, 1973 (vol. 104, #7&8), and Aug 24&31, 1974 (vol. 106, #8&9).

The Science Teacher had an issue on space, March 1973. The issue won an award for excellence in educational journalism by the Educational Press Association. (Editor M. Hawkins thanked G. Verschuur for his suggestions in planning the issue.)

Journal of College Science Teaching had an issue on astronomy in Dec. 1973 (guest editor R. Berendzen).

Items available from Executive Officer, AAPT, Drawer AW, Stony Brook, N.Y. 11790: a) "Resource Letter EMEA-1: Educational Materials in Astronomy and Astrophysics," by R. Berendzen and D. DeVorkin, 50¢ with stamped self-addressed envelope (appeared in American Journal of Physics, 41, 783-808, June 1973); b) "Guides to Innovations in Physics Teaching," (1400 entries giving brief descriptions of courses), vol. 1, Nontraditional formats, vol. 2, Courses for nonscientists, vol. 3, Courses for majors; \$2.00 per volume, handling \$1.00 if billing required.

"Origins" presents lectures by G. Wald, R. Jastrow, C. Ponnampereuma and P. Morrison on the origin of the universe, the solar system, and life. Four 50-minute tape cassettes, \$39.95 (\$34.95 for AAAS members), Dept. O-2, AAAS, 1515 Mass. Ave. N.W., Washington D.C. 20005. See advertisement in Science, 186, p. 159, 11 October 1974.

If you are interested in writing a column on astronomy for a newspaper, one person who has some experience in this is W. R. Kubinec (Physics Dept., The College of Charleston, Charleston, S.C. 29401). Who else has done this? Coordination might provide a more widely read astronomy column.

d) Some films not in the "Resource Letter."

"The Birth and Death of a Star," 25 min, color, distrib. by Public Information Div., American Inst. of Physics, 355 E. 45th St., New York, N.Y. 10017.

"Solar Atmosphere," 30 min, color, made at Big Bear Solar Observatory, distrib. by Office of TV, Radio and Film Activities, Cal. Tech, Pasadena, Calif. 91109 (\$5 rent, \$50 sale).

"A New Look at the Sun," 21 min, color, and "Storms on the Sun," 11 min, b/w, both made by CSIRO and distributed by Information Officer, Australian Embassy; the former movie is on the more popular level.

"Explorations in Space and Time," by M. L. Meeks (with a descriptive booklet by M. Zeilik II), a series of computer-generated films (also available as Super-8 cartridges or cassettes), distrib. by Houghton Mifflin Co., 1 Beacon St., Boston, Mass. 02107 (available for preview). (See J. College Science Teaching, 3, 113, December 1973.)

REPORT ON TGEA ACTIVITIES

a) Roster of consultants on astronomy education

This is a listing of AAS members who have expressed willingness to serve occasionally as consultants to educational institutions. Services may range from answering phone calls to short visits, or in some cases participation in special events. Consultants may ask for some compensation when more than a trivial amount of time or expense is involved.

If you wish to make use of this service, request a roster of listed astronomers near you from Mr. Gurin (address page 1).

If you wish to be listed (AAS members only), write to Mr. Gurin for a qualification form, which asks you to indicate the categories in which you have experience, feel qualified, and are willing to advise: Selection and proper use of small telescopes and supporting equipment, college-level astronomy survey courses, courses beyond the survey, non-technical courses for the public, planetarium, high-school, lower school grades, teacher training or up-dating, industrial organizations.

b) A collection of course syllabuses

We collect and distribute outlines or syllabuses of interesting astronomy or astrophysics courses intended primarily for the college non-science student. The aim is to help others organize new courses. Therefore interest centers on the courses that approach the subject in a distinctive manner.

The collection has just started. If you have an interesting course, please submit a reproducible copy of the course syllabus and brief course information (size and level of audience) to J. Wertz (address page 1).

If you wish to obtain the collection, send him a check for \$1.50 made out to the American Astronomical Society. To reduce reproduction costs we shall await contributions and orders through December 1974, and plan a mailing in January 1975.

c) Education sessions at the Rochester AAS meeting

At the instigation of Dr. Frank Six and others, the AAS Council established a new category "education" for submission of papers contributed to AAS meetings. The first such session was held at Rochester, N.Y. on August 22, 1974 and attracted an audience of about 80 astronomers. It terminated in a lively debate on the values of self-paced instruction and the testing of such values. Such sessions of contributed paper are planned annually.

Michael Zeilik II organized a special workshop on the writing of materials for self-paced instruction in astronomy.

A special TGEA session on August 23 focussed on the attitudes and backgrounds needed for teaching in small colleges, planetariums and high schools. It attracted about 80 astronomers, including at least a dozen planetarium directors. A report follows. (Organized by D. Wentzel, chaired by F. Six)

Teaching of Astronomy in Schools, Colleges and Planetaria.

Report by Lee T. Shapiro, Abrams Planetarium, East Lansing, Mich. 48823

The first speaker on the program was D. S. HALL, director of the Strasenburgh Planetarium, discussing "The Future of the Planetarium". Though the projection planetarium is 51 years old it still seems a space age device. The personnel that work at a planetarium are generally educators rather than researchers, and are attempting to meet educational needs at various levels. The opinion was expressed that the planetarium influences people at the emotional level rather than the cognitive level, since studies seem to show that there is equal astronomy learning in the planetarium and the classroom.

The reasons the public comes to the planetarium are varied, ranging from strictly educational to "a cheap date". These reasons should be examined in detail to better understand our role. The planetarium is designed as a research device for the lay public, not the research scientist. In discussing the distinction between

education and entertainment Hall referred to the quote " That which pleases teaches best". The small planetarium does best in the interaction between student and lecturer because of the intimacy of the set-up. In a one person planetarium that one person must wear all the seperate hats that are found in a major planetarium.

Public planetaria without a captive audience must fill seats and have shows, but must also present "truth". As an example, the Strasenburgh Planetarium has the largest production staff with 10 people including 2 artists, 4 technicians, a director, an astronomer and a sound engineer.

Next there was a panel discussion on teaching in small institutions. L. MARSHALL of Gettysburg College, Gettysburg, Pennsylvania discussed teaching at a small liberal arts college. He pointed out that such a position usually involves teaching more than just astronomy courses, e. g. physics, mathematics, etc. Such a position usually has a limited budget, little or no support staff, and you have to spend time finding equipment and supplies and serving on committees. However, the jobs are often well paying, not high pressure, and there is time for research in the summer.

G. MECHLER from the Cleveland Museum of Natural History urged students working in astronomy to take advantage of all opportunities that appear as they are studying for their degree. Keep their options open, take all side jobs for the experience, and try to get their foot in the door even when the pay is not good at the start.

M. CHARTRAND, chairman of the Hayden Planetarium, New York urged greater cooperation and coordination between colleges and planetaria. He spoke of college instructors working part-time at planetaria and planetarium staff members teaching part-time at colleges.

M. JACOBY of Rhode Island Junior College discussed the teaching opportunities at 2 year colleges. She cautioned, though, that such institutions will not become 4 year institutions, that they cannot support research expenditures either in time or money, and that a Masters degree is required to be an instructor. She also pointed out that most students at such institutions are working students, that many are the 1st generation to go to college, and that there are many adult education programs.

B. WERNER of Wayland High School said that a high school teacher had to be committed to education, and that it could be very rewarding but also very difficult. The major difference is in format; high school format is activity orientated. Anyone interested in this field should make themselves aware of the educational and student teaching requirements necessary in most states for certification.

In the third part of the program, A. HEISER of Dyer Observatory described the Summer Institute for College Teachers that he helped organize. They decided only to instruct on two specific topics, stellar evolution and external galaxies. They discovered from the applications that many of the people teaching astronomy had no astronomy background and advocated checking further into the preparation of people teaching astronomy. They also concluded there should be more institutes on specific subjects, not all of astronomy, and the length of the institutes should be decreased.

P. KNAPPENBERGER of the Science Museum of Virginia discussed a workshop of astronomy materials to bring teachers and astronomers together. (Details p. 6)

d) How do we best introduce modern astronomy in High-schools?

Paul Knappenberger organized a workshop June 17-19 which was attended by 21 high-school teachers, 3 science supervisors, and 13 astronomers. Each participant gained a greater understanding of the activities, schedules, responsibilities and needs of the groups represented. 17 of the teachers remained for an additional three days of a graduate-credit institute conducted by 4 of the astronomers.

It became clear that materials developed for use by teachers must be readily applicable in the classroom, without much additional preparation or study on the part of the teacher; most sources of information currently produced by astronomers do not meet this requirement and are seldom used by high-school teachers. From a list of over 30 suggestions for making astronomical information available to teachers, five were detailed further.

1) A series of workshops is to identify and collect presently used materials, review and collate them to identify the main "gaps", then (hopefully during the summer 1975) to develop materials for the "gaps". The emphasis would be not only on materials needed by teachers but on the ideas needed by astronomers across the country to introduce these materials to the teachers in their states. Thus the ultimate goal is the offering of teachers' institutes and establishment of astronomer-teacher communications in many more colleges and universities than is now the case.

This program is now beginning and so is a search for funding for the 1975 conference. If you wish to participate by contributing materials or becoming active in the conference, write to Paul Knappenberger (address page 1).

The other four methods investigated in some detail were ii) a newsletter aimed at high-school teachers, iii) TGEA involvement with the NSTA, iv) audio-visual materials, such as posters or recordings, and v) small brochures or reprints of popular articles for wide and easy distribution.

Small brochures are attractive because they are more flexible than texts and easier to distribute. The idea was tested by drafts of four "brochures" written under the sponsorship of NASA. Several workshop sessions were devoted to detailed criticism of these drafts, a process that would be beneficial to many more astronomers' writings. The four brochures to be published are: Chemistry between the stars (Richard H. Gammon), Extra-galactic astronomy (Kenneth C. Jacobs), Atoms in astronomy (Paul Blanchard), and the Supernova (W. C. Straka).

Outlook: The potential number of high-school teachers of astronomy is much larger than the number of college teachers. Most of the projects discussed at the workshop overwhelm the capability of the TGEA. Even if funding can be obtained, the TGEA members do not have the time. One promising role of the TGEA is to bring together those institutions that have interest in high-school astronomy education, and thus to promote the needed programs within established institutions. With no attempt at completeness, three institutions that are interested are the Lawrence Hall of Science (Berkeley, Calif. 94720, Dennis Schatz), Jackson State College (W. C. Straka, address page 1), and Science Museum of Virginia (P. Knappenberger, address page 1). Are there more? In general, the emphasis will be on teaching flexibility rather than any complete and fixed program. (Mr. Wesley D. Peterson wants to hear from high-school educators interested in adopting a textbook written specifically for the high-school level, if its contents met with their approval. Address 3504 Grange Avenue, Stockton, Calif. 95204.)

e) Astronomy in the National Parks

What better way to tell the public about astronomy than under the clear skies of the national parks? Von Del Chamberlain in co-operation with the National Park Service organized training sessions for naturalists so that they could provide sky interpretation to the people visiting the parks. The aim is to introduce ideas of modern astronomy through popular interest in the sky. Sky interpretation sessions now take place at several parks, during both summer and winter seasons. Further training sessions are planned. We urge similar projects for state parks!

Park naturalists move around from season to season. In order to establish sky interpretation firmly, continuity and astronomers' continued show of interest at the parks would be most valuable. This may be done through astronomical institutions near parks. In addition, if you visit a national park and would like to discuss astronomy with the naturalists, or even give an evening program, write to Von Del Chamberlain (address page 1). Hopefully some continued financial support can be obtained.

f) Traveling astronomy exhibit for schools and planetariums

Frank Jettner has shown that the several hundred planetariums in this country are in great need of astronomy exhibits and are not in a position to purchase them. Thus a traveling exhibit service would be of great benefit, and a prototype traveling exhibit is now under construction. Its topic is the expansion of the universe. The general opinion of museum directors today is that the traditional picture-and-writing exhibits are relatively ineffective; the state-of-the-art aims at audience involvement. Although this makes both design and construction of an exhibit costly, the operating costs of a traveling-exhibit service (management, transport, insurance, etc.) turn out to dominate the total cost.

The TGEA is not set up to accept the financial and quality-control responsibility such a project would entail. Perhaps the TGEA can help create such a service together with a university, a museum or a group of such organizations. We cannot seek funds until such arrangements appear feasible. If interested, write to F. Jettner or D. Wentzel (address page 1).

FINANCIAL SUPPORT

A grant from the Office for the Public Understanding of Science of the National Science Foundation supported activities d, e, and f above. (Grant GM-40972, Donat G. Wentzel, principal coordinator.)

The same office is concerned with science programs related to the Bicentennial. It has also awarded a grant to the Lawrence Hall of Science (Alan J. Friedman) for an exhibit "Astronomy in America" the core of which will be (indoor) telescope experiments involving the public. Astronomy is prominent in other actions supported by that office.

The four "brochures" that are part of activity d, above, are sponsored by NASA contract NASW-2571, G. Vershuur, principal investigator.

The AAAS is again running the NSF-supported Chautauqua-type short courses for college teachers. The 1974-75 program features astronomy in the Central Circuit, where Ralph Robbins and William Jeffrys (University of Texas at Austin) run a Workshop on Teaching Observational Astronomy.

If you have a Bicentennial program, such as a special event or opening of a new planetarium or telescope, you may list it with BINET, ARBA, 736 Jackson Place N.W., Washington D.C. 20276. The listing has nationwide subscribers such as airlines and appears subdivided by subject, geographical area, etc.

Summer research jobs for Ph. D. scientists whose time during the academic year is devoted mainly to teaching. A few positions will be open at the National Observatories during the summer of 1975, on a competitive basis. Send vita, research interest and an indication of current teaching load to:

- i) Director, Kitt Peak National Observatory, Tucson, Ariz. 85726 (deadline is April 1, including three letters of recommendation, one of which from the current department chairman).
- ii) HAO/NCAR Research Associateship Committee, PO Box 3000, Boulder, Colo. 80303 (deadline January 5, solar or solar-terrestrial physics, atmospheric sc.)
- iii) National Radio Astronomy Observatory, Charlottesville, Virg. 22901 (no information at press time).

AN "EDITORIAL" - WHAT SHOULD BE THE ROLE OF THE TGEA? By Donat G. Wentzel

The TGEA is a small organisation set up to help realize new ideas for astronomy education. The projects listed in this newsletter have allowed a very few participating astronomers to reach at least a fair fraction of astronomy educators. They have been aided by the increasing interest in astronomy, but simultaneously the increasing interest has multiplied the needs manyfold. Many of the projects now urged upon us tend to overwhelm us. Projects such as the traveling-exhibit service or a distribution in high-schools of popular journal reprints (pages 6 and 7 of this newsletter) would exceed the annual AAS budget; we are not organized to accept the financial responsibility and we are not set up to identify people who can exercise the needed quality-control over such projects so that we can sponsor them in good conscience.

Another project urged upon the TGEA is to increase contacts between professional astronomers and amateurs, schools and planetariums. Some astronomers have very good contacts with these groups, but it is a fact that we cannot "draft" more. We can only work to increase the interest and provide help in establishing and maintaining these contacts. Some of the TGEA projects are useful for this purpose. But I am very conscious that I have accepted and supported fewer projects than the number of ideas that I have not acted on because I considered them "too vague". Certainly others may be able to translate those ideas into viable projects within the capabilities of the TGEA.

With this editorial I ask you for two responses:

i) What should be the future of the TGEA? Given that other organisations show increased interest in astronomy education, should we consider our task finished? Should we continue in "low-key", helping to realize additional manageable projects and aiding other organisations to cooperate on the larger ones? Or should we attempt to restructure the TGEA? The "charter" of the TGEA expires August 1975. Discussion on its future should start now.

ii) To allow new ideas to be realized within the TGEA, and to allow me to devote some time again to research, I ask for nominations and/or volunteers to be the next chairperson of the TGEA (restricted to AAS members). Obviously, this person should be involved in discussing the future of the TGEA starting as soon as possible. I would like to be able to resign as of the AAS meeting in March 1975.

CALL FOR INFORMATION ON LABORATORY TEACHING

In order to up-date the previous TGEA newsletter Guide to Resources for Laboratory Activities in Astronomy (July 1973, available in limited supply from D. Wentzel, address page 1), please send information on student exercises, techniques, apparatus, journal papers, manuals and references dealing with laboratory exercises in astronomy to

Dr. Haym Kruglak, Physics Dept., Western Michigan University, Kalamazoo Mich. 49001

- List:
1. Title.
 2. Authors name and address.
 3. Complete reference if published.
 4. If published manual, publisher, date and cost.
 5. If new apparatus, name of device, manufacturer and catalogue number, cost.
 6. Other useful resources and suggestions, e.g. "home-made" apparatus.